CHAPTER 20

Earache

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There is a very long list of differential diagnoses for "otalgia" or painful ear. The most common include neuralgias, otitis, temporomandibular joint (TMJ) syndromes, tooth and oral pathology, cervical adenitis, ear barotraumas, and eustachian tube dysfunction. If the diagnosis is still uncertain after the appropriate history and physical examination, less common diagnoses need to be considered such as tumors in the nasopharyngeal area or in the ear.

Ear pain is characterized as primary or secondary. Those causes associated with ear pathology such as acute otitis media, external otitis, and tympanic membrane perforation are considered primary. Secondary causes are those sources of pain that are referred to the ear from other anatomic sites such as TMJ, cervical adenitis, or a tooth abscess.

It is important to examine the head and neck very methodically in order to identify the source of the pain. Keep in mind the multiple innervations of the ear and the structures which are also innervated by these common pathways.

ACUTE OTITIS MEDIA

Acute otitis media (AOM) is diagnosed when a patient presents with fluid in the middle ear with acute systemic symptoms such as fever, irritability, and pain. AOM occurs when fluid builds up in the eustachian tube causing increase in negative pressure and fluid collection in the middle ear from a URI or allergic rhinitis. This fluid in the middle ear provides the culture medium for bacteria or viral growth and subsequent infection. The most common pathogens are *Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis*, and viruses. Viruses were identified in 16% of children diagnosed with AOM using several studies. The most common viruses were RSV, rhinoviruses, influenzaviruses, and adenoviruses.

Symptoms

- Fever
- Irritability
- Pain
- Difficulty hearing

Signs
- Red bulging tympanic membrane
- Otorrhea
- Air fluid level in the middle ear
- Decreased hearing on examination
- Immobile tympanic membrane using the pneumatic otoscope

Workup
- Examination reveals signs of inflammation such as a red bulging tympanic membrane.
- Otorrhea or purulent exudate may be present in the auditory canal.
- Air fluid level and poor mobility of the TMJ by pneumatic otoscopy
- It is important to remember that redness can be caused by trauma and crying and may not be related to an infection.
- If the purulent exudate in the ear from AOM builds up too much pressure, a perforation in the tympanic membrane may occur. In this case pus is observed in the external canal and the perforation is visible with an otoscope.

Comments and Treatment Considerations
The pain can be of varying intensity and responds to acetaminophen (Tylenol), NSAIDs, and local anesthetic drops such as Auralgan (antipyrine, benzocaine, and dehydrated glycerin). Treatment of AOM has gone through dramatic change (Table 20-1). New guidelines recommend treating all children younger than 6 months and all children with severe illness (which includes fever >39° C and severe pain) with antibiotics.

For children older than 6 months and adults, watchful waiting with close follow-up (48 to 72 hours) can be planned. The diagnosis is often difficult because of the difficult use of the pneumatic otoscope; therefore, it is recommended for children less than 2 years that antibiotic treatment be started.

For uncertain cases and less severe symptoms in children older than 2 years of age watchful waiting for 48 to 72 hours before beginning treatment may be a strategy. Treatment of choice with amoxicillin (80 to 90 mg/kg/day) is recommended and macrolides are the second choice for penicillin-allergic patients.

Resistance to sulfa drugs has become a problem. Other drugs recommended as second line therapy are ceftriaxone and amoxicillin-clavulanate (90 mg/kg/day of the amoxicillin component). These should be reserved for children with resistant bacteria. Cefuroxime has been shown in recent studies to have poor activity against penicillin-resistant *S. pneumoniae*.

In children with refractory disease, tympanocentesis may be useful in determining the bacterial cause of disease and evaluating resistance to antimicrobials, though this is rarely performed. Decrease in frequency of AOM caused by *S. pneumoniae* has been seen since the institution of immunizations began against this pathogen.

All children less than 2 years and those at risk for recurrent disease should receive the pneumococcal conjugate vaccine. Children at risk are those in daycare and those with a family history of acute otitis in siblings.

Table 20-1. Medications Used in the Management of Otitis Media

MEDICATION	DOSING RANGE
Antibiotics	
Amoxicillin (Amoxil)	80-90 mg/kg PO daily in divided doses
Amoxicillin-clavulanate (Augmentin)	Amoxicillin 90 mg/clavulanate 6.4 mg/kg PO daily in 2 divided doses
Azithromycin (Zithromax)	10 mg/kg PO on day 1, followed by 5 mg/kg/day as single does for 4 days
Cefdinir (Omnicef)	14 mg/kg PO in 1 or 2 doses
Cefpodoxime (Vantin)	10 mg/kg PO once daily
Ceftriaxone (Rocephin)	50 mg/kg IM or IV once daily
Cefuroxime (Ceftin)	30 mg/kg/day PO in 2 divided doses
Clarithromycin (Biaxin)	15 mg/kg/day PO in 2 divided doses
Clindamycin (Cleocin)	30-40 mg/kg/day PO in 3 divided doses
Levofloxacin (Levaquin)*	10 mg/kg PO every 12 h for 10 days; max 500 mg/day
Topical Antimicrobials	
Ciprofloxacin/dexamethasone otic suspension (Ciprodex)	3 drops instilled into ear canal twice daily for 7 days
Ofloxacin otic solution (Floxin Otic)	AOM: 5 drops instilled into ear canal twice daily for 10 days CSOM: 10 drops instilled into ear canal twice daily for 14 days
Analgesics	
Acetaminophen (Tylenol)	10-15 mg/kg PO every 4-6 h prn; do not exceed 5 doses in 24 hr
Ibuprofen (Motrin)	4-10 mg/kg PO every 6-8 hr prn; max dose 40 mg/kg/day
Antipyrine/benzocaine otic solution (Auralgan)	Fill ear canal with solution every 1-2 hr prn

*Off-label use.

AOM, Acute otitis media; *CSOM,* chronic suppurative otitis media; *max,* maximum.
From Neff, M: Practice Guidelines: AAP, AAFP release guideline on diagnosis and management of acute otitis media *Am Fam Physician* 69:2713-2715, 2004.

Otitis media with effusion is diagnosed with a retracted tympanic membrane, usually with no pain or fever. There is usually an abnormal tympanogram that reveals decreased tympanic membrane movement with pressure gradients. The acute illness that is often associated with AOM and the physical findings of inflammation in the middle ear along with systemic symptoms of illness help to differentiate the two.

EXTERNAL OTITIS

External otitis is usually caused by a disruption in the protective lining of the external canal. Cerumen is produced from gland secretions found in the canal. This ear wax protects the external canal from pathogenic invasion and maintains a pH less than 6, which prevents bacterial and fungal overgrowth. External otitis may be acute or chronic. The acute form is usually bacterial or can be fungal, though rarely. A dermatologic skin disorder is usually the etiology of chronic external otitis.

Symptoms

- Feelings of discomfort or pain and soreness in the ear canal
- Swelling of the soft tissue in the external canal and around the os
- Hearing loss related to decrease in air conduction through the narrowed swollen external canal
- Pruritus

Signs

- Tender external canal on palpation
- Tender ear with manipulation of the pinna
- Edematous soft tissue of the external canal and occasionally the tragus and pinna
- Exudate in the external canal
- Tender lymphadenopathy in the postauricular and preauricular lymph nodes

Workup

- When evaluating the patient consider:
  - Swimming, hair washing, foreign body trauma, or excoriations of the canal can lead to invasion of the skin by common pathogens or fungi.
  - Trauma is commonly caused by hearing aids, cotton-tipped swabs, hairpins, and pencils and may lead to disruption of protective barriers.
  - Environments with high humidity are usually associated with increased incidence of otitis externa.
  - It is most common between the ages of 6 and 12, and less common after age 50.

- *Pseudomonas aeruginosa* and *Staphylococcus aureus* are the most common bacterial pathogens.
- Otitis externa diagnosis requires a careful history to determine the potential cause of the disruption of the protective barrier.
- Educate patients on the causes of this problem.
- It is important to identify patients with skin disease such as eczema for treatment to prevent recurrences.
- If the otitis externa fails to resolve with usual treatments, it is imperative to consider malignant otitis externa.
- Test all patients for diabetes mellitus who are diagnosed with malignant otitis externa.
- Cultures of the exudate should be done in all patients with diabetes mellitus prior to beginning any treatment.

Comments and Treatment Considerations

Topical acidifying solutions (acetic acid) or local antibiotic and steroid solution such as Cortisporin Otic (neomycin/polymixin B/hydrocortisone) can be used. A wick is commonly placed so that the solutions may be successfully placed and maintained in an often swollen external ear canal.

During treatment patients should avoid getting water in the ear. Cotton balls coated with Vaseline can keep water out of the ear while bathing.

Dermatologic conditions such as eczema or contact dermatitis may cause similar presentations. Patients present with itching, dryness, and flaky skin of the external canal. The history usually is important and identifies history of eczema.

Treatment with topical medication like neomycin can cause contact dermatitis reaction and may be mistaken for bacterial otitis externa. Often secondary bacterial infections occur due to chronic scratching with fingernails, hairpins, and so on that cause excoriations of the skin in patients with eczema or contact dermatitis.

Fungal external otitis (up to 10%) may have similar presentations in which there is little to no discharge and usually minimal swelling. The examination reveals tiny black or white spores and filaments. Treatment requires antifungal agents such as clotrimazole or tolnaftate.

Malignant otitis externa occurs in patients with diabetes mellitus and other conditions causing immunocompromised states. *P. aeruginosa* is the most common pathogen. Patients present with several weeks to months of itching, exudate, and decreased hearing. This condition responds well to the fluoroquinolones with 6 to 8 weeks of treatment.

Malignant otitis externa spreads to the underlying bone and into the meninges or vascular system, which can cause severe morbidity and mortality. Any patient whom you suspect has malignant otitis externa should be cultured prior to treatment. Poor response to oral treatment requires hospitalization.

TEMPOROMANDIBULAR JOINT SYNDROME

A diagnosis of TMJ syndrome is considered in patients who present with ear and face pain. Diagnosis is based on the history of pain and functional problems the patient has experienced. TMJ disorders are either intracapsular or extracapsular. Most common are the extracapsular etiologies referred to as myofascial pain of the masticatory muscles, TMJ myofascial pain syndrome, TMJ dysfunction syndrome, or TMJ syndrome.

- Rheumatoid arthritis, osteoarthritis, and articular displacements are causes of intracapsular disease.
- The etiology of TMJ is thought to be due to stress, jaw malocclusion, jaw clenching, bruxism, degenerative joint disease, cervical muscle dysfunction, dental surgery, TMJ intra-articular problems, or trauma.
- Often multiple etiologies are identified in one patient.
- Many patients have a history of grinding their teeth at night (bruxism) or chronic clenching of the jaw.
- Jaw malocclusion may be genetic.
- Malocclusion may also relate to chronic anxiety with chronic masticatory muscle tension.
- Patients with body asymmetry, cervical lordosis, scoliosis, and joint laxity have a higher incidence of developing problems with the TMJ.
- TMJ syndrome is more common in women than in men: 30- to 40-year-old women are more affected by TMJ problems.
- The pain can be in the ear but usually is made worse by chewing. Patients usually present after several months of the painful problem. They note the pain is worse with chewing and stressful and anxiety-producing situations.

Symptoms

- Headache
- TMJ sounds
- Pain in the face and neck
- Feelings of jaw muscle fatigue

Signs

- Masticatory muscle tenderness to palpation (41%) +++
- TMJ clicking sounds (22%) ++
- Dislocation of the joint palpated while the patient opens and closes the mouth
- Limited mobility of the TMJ preventing a wide opening of the mouth

Workup

- The examination is usually consistent with marked tenderness over the joint.
- Joint displacement may be noted on examination when the patient opens the jaw widely.
- Noises such as clicking and excess movements of the jaw are noted by patients especially when there is displacement of the articular disk.

- Physical examination may reveal a narrow chin and asymmetry of the face with the affected side being smaller.
- Ask the patient to open and close the jaw to observe jaw dislocation if present.
- Bilateral palpation of the muscles of mastication (masseter, temporal, pterygoid) is performed to check for tenderness and asymmetry.

Comments and Treatment Considerations

The diagnosis is usually made on the basis of history and physical examination. If patients fail usual treatment strategies, an MRI is the best test to detail the joint anatomy including placement of the disk, disk morphology, and degenerative joint changes.

A nonreducing disk is significant when viewed by MRI. A restricted TMJ condylar movement by physical examination is also significant. Because it involves the muscles of mastication, which include the temporal muscle, temporal arteritis should be included in the differential.

Treatment includes discouraging the patient from eating food that requires opening the jaw widely (biting an apple) and refraining from chewing gum or biting hard substances such as hard candy. NSAIDs may be helpful for pain management.

Jaw exercises help to relax the muscles of mastication. Patients should be screened for physical findings of chronic inflammatory joint disorders such as RA. Tricyclic antidepressants are often used to relieve stress and for pain management.

Muscle relaxants may be used to relive the spasm in the facial muscles. Patients often get relief from the use of mouth guards that relieve nighttime jaw clenching. Injections of steroids and lidocaine (Xylocaine) are used if symptoms continue. Botulinum toxin injections into the muscles of mastication can provide relief if other treatments have not worked.

Some dentists have special interest in caring for patients with TMJ syndrome and will help with prescribing the mouth guards and evaluating patients for treatable malocclusion and other associated dental problems. Beware that occlusal appliances may increase the symptoms of sleep apnea.

Some patients respond well to low laser therapy. Surgery is the last resort but should not be done unless it is preceded by arthroscopy.

Beware of initiating narcotic therapy for this chronic condition. Patients should be warned about the chance of addiction. Consider only when nonaddicting alternatives are contraindicated.

TYMPANIC MEMBRANE PERFORATION

The etiology of tympanic membrane perforation may be related to AOM, may occur after tympanostomy tube placement, or may be caused by a traumatic event. An earache is often relieved when a perforation occurs, which relieves the negative pressure buildup in the middle ear caused by the presence of increasing amounts of purulent exudate.

Traumatic tympanic membrane perforation is associated with sudden onset of ear pain. The etiology of the pain is often associated with the accident but the diagnosis of perforation does not occur until examination of the ear. Water accidents, barotraumas, explosions, penetrating injuries, temporal bone fractures, and being slapped on the ear are common causes of perforated eardrums. Perforations following tympanostomy tube placements occur from nonhealing of the site after the tube is extruded or may be caused by a retained tube.

Perforations of less than 2 mm heal quickly. Central perforations heal better than peripheral perforations. More than 60% of perforations heal in less than 1 month. Greater than 90% of temporomandibular perforations heal in less than 3 months.

Symptoms

- Patients present with sudden onset of pain.
- Bleeding from the ear through the external canal os
- Noises of air in the ear when blowing the nose

Signs

- Examination of the tympanic membrane reveals a disruption or hole.
- Presence of blood on the tympanic membrane
- Purulent exudate in the external canal
- Conductive hearing loss
- Hearing test should always be ordered when there is a history of trauma.
- If sensorineural loss is noted, a concern for inner ear trauma should be explored. A disconnection of the stapes from the other ossicles may have occurred during the trauma and will need attention.

Workup

- Patients who call and complain of sudden ear pain, blood or purulent discharge in the ear should be seen immediately.
- Documentation of hearing should be performed.
- It is important to examine both ears.
- The patients' ears should be examined for any traumatic event that may be associated with perforation.

Comments and Treatment Considerations

A complication may be development of a middle ear infection. It is important that the external canal remain dry and free of water while the perforation is healing. Patients should not swim and may use ear plugs or cotton balls coated with Vaseline to prevent water from getting into the ear while bathing.

If the perforation fails to heal, surgery is an option. A patch using the temporal muscle, gelatin film, a paper patch, or fat can be used by the otolaryngologist for myringoplasty.

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